Prepared for

BFI Waste Systems North America, LLC
26 West 580 Schick Road
Hanover Park, IL 60133

TECHNICAL MEMORANDUM

MODIFIED REMEDY

MIG/DeWANE LANDFILL SUPERFUND SITE
BELVIDERE, BOONE COUNTY, ILLINOIS

EPA ID# ILD980497788

Prepared by

Geosyntec consultants

134 N. LaSalle Street, Suite 300
Chicago, Illinois 60602

Project Number CHE8214

5 December 2012
Revision 2

Geosyntec consultants

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5 December 2012

Ms. Nicole Wilson, P.E.
Remedial Project Manager
Federal Facilities Unit
Remedial Project Management Section
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Response to Comments:
IEPA Review Comments on Revision 1 of the Technical Memorandum – Modified Remedy, dated 5 September 2012
MIG/DeWane Landfill Superfund Site (Site)
Belvidere-Boone County, Illinois

Dear Ms. Wilson:

On behalf of BFI Waste Systems of North America, LLC (BFINA), this letter presents a response to Illinois Environmental Protection Agency (IEPA) Comments dated 14 November 2012 on the subject document submitted by Geosyntec on behalf of BFINA. Geosyntec is providing the responses to the 14 November 2012 comments to supplement Revision 1 of the technical memorandum. Revision 2 of the technical memorandum text is attached for your review. Because there are no specific comments from IEPA on the figures, tables or appendices only the text was revised. As we discussed, the Revision 2 text can replace the Revision 1 text in the 3-ring bound copies of the technical memorandum currently held by IEPA. Also, as discussed, a complete (text, figures, tables, and appendices) unbound copy will be provided to you for the IEPA file.

In the 14 November 2012 IEPA letter, IEPA indicated that the "Illinois EPA still agrees with the concept of improving the existing cover in lieu of destroying the interim cover to install a geosynthetic clay liner (GCL) and geonet drainage layer. However, the cover would need to meet the required minimum of three feet thickness". After a 29 November 2012 telephone conference call with IEPA, BFINA and Geosyntec, it was clarified that the low permeability layer of the landfill cover should meet the minimum thickness of three (3) feet.

Revision 2 of the technical memorandum proposes that the existing Interim Remedial Measures (IRM) cover will be improved by placing additional compacted clay cover in the areas on the side slopes where the cover is less than three (3) feet thick. The area to be improved includes approximately 19.3 acres of the landfill cover which have less than the required minimum of

three (3) feet thickness. As discussed in the technical memorandum, the remaining areas of the landfill cover meet the minimum thickness of three (3) feet.

For Revision 2 of the technical memorandum, Geosyntec has revised all relevant sections of the technical memorandum text to include the proposed minimum three (3) feet of thickness for the landfill cover.

Should you have any questions or comments on the above information or on Revision 2 of the technical memorandum, please contact Mr. John Seymour at (312) 416-3919 or myself at (312) 416-3909 or (312) 658-0500.

Sincerely,

Brad Bodine, PE
Project Engineer

John Seymour, PE
Principal

Enclosure

Copies to: Eric Ballenger; BFINA (1 copy)
Rustin Kimmel; BFINA (1 copy)
Howard Caine; U.S. EPA (1 copy)
John Grabs CDM (1 copy)
Jay Timm; IEPA Community Relations Coordinator (1 copy)
Site Document Repository (to Jay Timm) (1 copy)
IEPA Bureau of Land file copy (to Nicole Wilson) (1 complete copy - unbound)

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EXECUTIVE SUMMARY

A Modified Remedy is proposed for the MIG/DeWane Landfill Superfund Site based on new and significant information collected since the Record of Decision (ROD) was issued.

Description of Modified Remedy

The proposed Modified Remedy includes modifying the landfill cover component of the ROD Remedy. No other changes to the ROD Remedy are proposed. The Modified Remedy would include making improvements to the substantial Interim Remedial Measures (IRM) landfill cover instead of constructing the new landfill cover component of the ROD Remedy. The IRM landfill cover was installed in 1993 in accordance with an U.S. Environmental Protection Agency (U.S. EPA) Administrative Order on Consent and an U.S. EPA and Illinois Environmental Protection Agency (IEPA) approved scope of work.

The proposed improvements to the IRM landfill cover would include placing additional compacted clay cover in areas on the side slopes where the cover is less than three (3) feet thick and grading of the existing landfill crest to establish a minimum slope of three (3) percent, consistent with the ROD Remedy. The improved areas would receive a minimum of six (6) inches of topsoil and seeded to establish and sustain vegetative growth.

Rationale for Modified Remedy

The Modified Remedy is proposed because new and significant data have been collected since the ROD was issued that support the Modified Remedy. These new and significant data are not included elsewhere in the Administrative Record file for the site. These data, which include significant additional IRM landfill cover thickness measurement data, leachate level measurement data, and groundwater quality data, indicate that the IRM landfill cover system has achieved an effectiveness that is substantially equivalent to that predicted for the ROD Remedy landfill cover component. These data are summarized as follows:

- ***New Measurements of the Thickness and Modeled Hydraulic Efficiency of the IRM Landfill Cover.*** Eighty-six new cover thickness measurements were used to assess the thickness of the IRM landfill cover. The data indicated that the IRM landfill cover top (crest) averages 11.5 feet thick with some locations up to 19 feet thick. When the crest and side slopes are modeled, these new measurement data indicate that the hydraulic efficiency or effectiveness of the IRM landfill cover (and the proposed improved IRM landfill cover) is 98%. That is, the IRM landfill cover (and the proposed improved IRM landfill cover)

is 98% effective in reducing infiltration into the landfill. The ROD Remedy landfill cover is estimated to have a hydraulic efficiency of 99%. The generic IAC § 811 soil cover (considered relevant and appropriate by the U.S. EPA and IEPA), is estimated to have a hydraulic efficiency of 95%. The benefits of the very thick IRM landfill cover are demonstrated by significant reductions in landfill leachate levels and significant improvement in groundwater quality as summarized below.

- ***New Data Indicating Significant Reduction in Leachate Level.*** The effectiveness of the IRM landfill cover has been demonstrated by the significant reduction in the leachate levels within the landfill. In 2008, the leachate head was measured in 58 gas vents/wells and two remedial investigation (RI) leachate wells. These data indicate that leachate levels in the landfill have reduced an average of approximately two (2) feet between 1995 and 2008.

- ***New Data Indicating Significant Improvement in Groundwater Quality.*** Comparison of recent groundwater quality data (April 2010, December 2010, and December 2011) to data collected during the RI indicate a significant decrease in groundwater concentrations of contaminants of concern (CoCs) identified in the ROD. Since April 2010, only one organic CoC (benzene) has been detected at the site at a single groundwater monitoring well location (MW06S), which is located immediately adjacent to the landfill. The benzene concentrations at MW06S in each of the recent three groundwater monitoring events have just exceeded the EPA Maximum Contaminant Level (MCL)/Illinois State Class I Groundwater Standard (ICGS). In contrast, during the RI, benzene and other organic CoCs, including 1,1-dichloroethene, 1,1-dichloropropane, tetrachloroethene, trichloroethene, and vinyl chloride, were detected in multiple groundwater monitoring wells at concentrations significantly above their respective MCLs/ICGSs. These data indicate that the CoC concentrations have been reducing more quickly than estimates documented in the Focused Feasibility Study.

Evaluation of Modified Remedy

The Modified Remedy was evaluated with respect to the NCP §300.430 remedy selection requirements (nine evaluation criteria). This evaluation demonstrated that the Modified Remedy satisfies the statutory requirements.

- The Modified Remedy is protective of human health and the environment; compliant with Federal and State requirements that are applicable or relevant and appropriate, and/or compliant with NCP § 300.430(f)(1)(ii)(c), which

documents that a remedy may be selected (under specific conditions) that does not meet all potentially applicable or relevant and appropriate requirements; and provides long-term effectiveness and permanence in a manner that is essentially equivalent to the ROD Remedy.

- The Modified Remedy provides a higher degree of short-term effectiveness and implementability than the ROD Remedy. The Modified Remedy would: (i) significantly reduce the period of time needed to implement the remedy; (ii) significantly reduce the risk posed to workers, the community and the environment during construction; and (iii) significantly limit potentially substantial rainfall infiltration and subsequent leachate generation during the construction of the ROD Remedy landfill cover (while a portion of the IRM landfill cover is being removed and the new cover is being constructed).

- The Modified Remedy is expected to have a cost approximately 30 percent less than the ROD remedy with essentially an equivalent effectiveness.

The Modified Remedy was also evaluated with respect to *Superfund Green Remediation Strategy* (U.S. EPA, 2010). This evaluation demonstrated that the Modified Remedy would have a significantly smaller environmental footprint than the ROD Remedy during remedy implementation.

Consistent with providing a higher degree of Short-Term Effectiveness, reducing the environmental footprint for the Modified Remedy also serves to reduce the risk of adverse impacts to site workers and local community residents during remediation implementation. This is significant considering that approximately 1,500 people live within one (1) mile of the site and nearby residences within Wycliffe Estates are located within approximately 800 feet from the landfill.

The proposed Modified Remedy represents an appropriate remedy change for the MIG/DeWane Landfill Superfund Site. The Modified Remedy meets the statutory requirements, has an essentially equivalent effectiveness as the ROD Remedy, is significantly more cost-effective than the ROD Remedy, and would be more protective of human health and the environment and have a smaller environmental footprint than the ROD Remedy during implementation.

1. INTRODUCTION

This Technical Memorandum proposes a Modified Remedy for the MIG/DeWane Landfill Superfund Site ("site") located in Boone County, Illinois (**Figure 1**). This Technical Memorandum was prepared for BFI Waste Systems North America, LLC (BFINA) by Geosyntec Consultants (Geosyntec). This Revision 2 addresses a comment letter from the Illinois Environmental Protection Agency (IEPA) dated 14 November 2012.

This Technical Memorandum provides: (i) a description of the proposed Modified Remedy, including the primary differences between the Modified Remedy and the Record of Decision (ROD) Remedy (U.S. EPA, 2000); (ii) the rationale for the Modified Remedy; and (iii) an evaluation of the Modified Remedy with respect to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) §300.430 remedy selection requirements (nine evaluation criteria). The Modified Remedy was also evaluated with respect to the U.S. EPA's *Superfund Green Remediation Strategy* (U.S. EPA, 2010).

The rationale for the Modified Remedy is based on new and significant information collected since the ROD was issued. This new information, which is not included elsewhere in the Administrative Record file for the site, includes significant additional IRM landfill cover system thickness measurement data, leachate level measurement data, and groundwater quality data.

Submittal of this Technical Memorandum follows a 28 February 2012 meeting with the Illinois Environmental Protection Agency (IEPA) in which BFINA and Geosyntec presented a summary of the rationale for the Modified Remedy documented herein. The presentation handouts are included in **Appendix 1**.

2. DESCRIPTION OF MODIFIED REMEDY

This section provides a description of the proposed Modified Remedy, including the primary differences between the Modified Remedy and the ROD Remedy.

The Modified Remedy includes modifying the landfill cover component of the ROD Remedy. No other changes to the ROD Remedy are proposed. A summary of the ROD Remedy and Modified Remedy components is presented below:

Remedy Component	ROD Remedy	Modified Remedy
leachate collection and monitoring system	✓	✓
active and passive landfill gas collection system and monitoring program	✓	✓
leachate surface impoundment closure	✓	✓
surface water diversion system	✓	✓
access restrictions and institutional controls	✓	✓
natural attenuation of groundwater	✓	✓
long-term groundwater monitoring	✓	✓
long-term operation and maintenance program	✓	✓
new landfill cover system	new landfill cover	***improve IRM landfill cover***

The Modified Remedy would include making improvements to the substantial Interim Remedial Measures (IRM) landfill cover instead of constructing the new landfill cover component of the ROD Remedy. A summary comparison of the landfill cover components of the ROD Remedy and the proposed Modified Remedy is presented below:

ROD Remedy Landfill Cover Component	Modified Remedy Landfill Cover Component
▪ ***Soil Protection and Vegetative Layer*** - minimum 2 ½ feet thick on the crest of the landfill with a taper to a minimum of 2 feet at the toe of the slope. ▪ ***Drainage Layer*** - geosynthetic (geonet and geotextile). ▪ ***Barrier Layer*** - geosynthetic clay liner (GCL), bentonite between a geosynthetic flexible membrane and a geotextile. ▪ ***Subsoil/Grading Layer*** - minimum 12 inches thick to provide protective base for Barrier Layer (re-compacted IRM cover material). ▪ Minimum final grade of the total cover system of 3 percent.	▪ ***IRM landfill cover*** - consisting of an average of 11.5 feet compacted clay and topsoil on the landfill crest and an average of 3.8 feet of compacted clay and topsoil on side slopes. The IRM landfill cover generally consists of the following components: ✓ Variable thickness grading layer; ✓ 2-foot thick minimum compacted low-permeability clay soil layer; ✓ 6-inch thick topsoil/vegetation soil layer; and ✓ Established vegetation. ▪ ***IRM landfill cover improvements*** - placing additional compacted clay cover in areas on the side slopes where the cover is less than 3 feet thick and grading of the crest to establish a minimum slope of 3 percent. The improved and graded areas would receive a minimum of 6 inches of topsoil and seeded to establish and sustain vegetative growth.

The IRM landfill cover was constructed in accordance with an U.S. EPA Administrative Order on Consent (AOC) and an U.S. EPA and IEPA approved IRM scope of work documented in *Revised Technical Memorandum on Interim Response Measures* (Golder Associates, Inc. 1991). The purpose of the IRM landfill cover was to address exposed waste and a 5 to 10-acre depression on the crest of the landfill that was resulting in leachate seeps. The IRM landfill cover was constructed in 1993 and as documented herein, it has been very effective in significantly reducing infiltration of precipitation into the landfill by promoting precipitation runoff and eliminating ponding on the landfill.

The IRM landfill cover construction included a substantial thickness grading layer (backfilling and grading of the top and side slopes of the landfill to cover exposed waste and promote precipitation runoff); a 2-foot thick compacted low-permeability clay soil layer; a 6-inch thick topsoil/vegetation soil layer; and establishment of vegetation. As documented in Section 3.2.1, the substantial grading layer thickness needed to meet the AOC, resulted in an average IRM landfill cover thickness on the crest of 11.5 feet thick with some locations up to 19 feet thick.

A summary of the construction of the primary IRM landfill cover layers, as documented in the *Final Construction Report - Construction Activities, Interim Remedial Measures* (Golder Associates, Inc., 1993), is presented below:

- ***IRM Landfill Cover Grading Layer.*** The variable thickness grading layer was placed over the crest of the landfill to achieve a minimum four (4) percent slope. Approximately 168,500 cubic yards of compacted soil was placed for the grading layer. The grading layer soil was obtained from the onsite borrow area located directly west of the landfill. Preconstruction and construction testing data indicated that the grading layer soil was predominantly silty clay (CL). Construction compaction testing data documented that the grading layer soil was compacted to an average 96 percent of maximum standard Proctor (ASTM D-698) dry density.

- ***IRM Landfill Cover Low-Permeability Layer.*** The low-permeability layer was placed over the grading layer. Two (2) feet of clay soil was placed and compacted in 6-inch lifts. The low-permeability layer soil was obtained from the borrow area located directly west of the landfill. Preconstruction and construction testing data indicated that the low-permeability layer soil was silty clay (CL). Construction compaction testing data documented that the low permeability layer was compacted to an average 97 percent of maximum standard Proctor dry density. Laboratory permeability testing data documented

an average permeability of 3.8 x 10^{-8} centimeters per second. In addition, IRM construction confirmation thickness measurement data documented that the low-permeability layer was thicker than the design minimum of two (2) feet at each measurement location.

The Modified Remedy would include placing additional compacted clay cover in limited areas on the side slopes where the cover is less than three (3) feet thick and grading of the IRM landfill crest to establish a minimum slope of three (3) percent, consistent with the ROD Remedy. It is estimated that the area of the landfill side slopes requiring improvement to achieve a minimum 3-foot thick compacted clay cover is approximately 19.3 acres. It is estimated that approximately 15 to 20 percent of the crest (2.5 to 3.4 acres) would require regrading to achieve a minimum slope of 3 percent. It is anticipated that the onsite borrow area located west of the landfill, and previously used to provide soil for the IRM landfill cover, would be utilized for the landfill cover improvements.

The improved landfill cover areas would receive a minimum of 6 inches of topsoil and seeded to establish and sustain vegetative growth. Erosion controls would be maintained until the vegetation has been adequately established.

3. RATIONALE FOR MODIFIED REMEDY

3.1 Overview

New and significant information has been collected since the ROD was issued that support the proposed Modified Remedy. These new and significant data are not included elsewhere in the Administrative Record file for the site. These data, which include significant additional IRM landfill cover system thickness measurement data, leachate level measurement data, and groundwater quality data, indicate that the IRM landfill cover system has achieved an effectiveness that is substantially equivalent to that predicted for the ROD Remedy landfill cover component.

The following sections summarize the new and significant information that has been collected since the ROD was issued and presents the rationale for the modified remedy.

3.2 IRM Cover Effectiveness

3.2.1 Thickness, Configuration, and Vegetation

Eighty-six individual clay thickness data points were used to assess the thickness of the IRM landfill clay portion of the cover. The topsoil thickness measurements from these data points were not included in the clay cover thickness assessment. The data indicated that the IRM landfill clay cover top (crest) averages 11.5 feet thick with some locations up to 19 feet thick. These data included clay thickness soil boring data from 41 gas vents and 17 dual-phase gas wells installed in 2008 as documented in the *Completion Report for Remedial Construction* (Geosyntec Consultants, 2010a), data from 24 Geoprobe® soil borings advanced in 2006 to assess the cover thickness as documented in the *Predesign Field Investigation Report* (Geosyntec Consultants, 2007b), and data from four gas probes installed in 1993 as documented in the *Final Remedial Investigation Report* (Clayton Environmental Consultants, 1997).

The clay cover thickness data points include the combined thickness of the IRM cover, which consists of the low permeability layer and the grading layer (not the topsoil). The low permeability layer and the grading layer were visually indistinguishable when collecting the soil boring data during above-mentioned installation activities. The two layers were not able to be distinguished due to several contributing factors which are described in the *Final Construction Report - Construction Activities, Interim Remedial Measures* (Golder Associates, Inc., 1993). The primary reasons are as follows:

- The soils used for the low permeability layer and the grading layer were excavated from the same borrow pit directly west of the landfill.
- The soils were both comprised of silty clay (CL). Preconstruction and construction testing data indicated that the grading layer soil was described as

predominantly silty clay (CL) and the low permeability layer was classified as silty clay (CL).

- Both soil layers were compacted to a similar degree. Construction compaction testing data documented that the grading layer soil and low permeability layer soil was compacted to an average 96 percent and 97 percent of maximum standard Proctor (ASTM D-698) dry density, respectively.
- The average water contents of the placed clay soils were 13.6 percent for the low permeability layer and 12.2 percent for the grading layer which are very similar and would yield similar compaction results.

Data from 23 measurement points were collected from the top (crest) of the landfill and data from 63 of the measurement points were collected from the landfill side slopes. These cover thickness measurement data are summarized in **Table 1**, from the reports documented above.

The measured IRM landfill cover minimum and maximum and calculated average thickness data for the landfill crest, the landfill side slopes, and the entire landfill are summarized below:

Measured/Calculated	IRM Landfill Cover Thickness (feet)		
	Landfill Crest	Landfill Side Slopes	Entire Landfill
Maximum	19.0	12.5	19.0
Average	11.5	3.8	5.8
Minimum	5.0	1.5	1.5

The measured IRM landfill cover thickness was 3.0 feet or greater at 60 of 86 measurement locations and 2.0 feet or greater at 77 of the 86 measurement locations. **Figure 2** illustrates the extent of the cover thickness greater than 3.0 feet (approximately 28 acres or 57% of the landfill cover), greater than 2.0 feet and less than 3.0 feet (approximately 15 acres or 33% of the landfill cover), and limited areas less than 2.0 feet (only approximately 4 acres or 9% of the landfill cover). The significant thickness of the soil cover on the crest, as much as 19.0 feet, is the result of the significant quantity of IRM grading layer soil used to fill the flat and depressed areas of the landfill prior to the IRM compacted clay layer construction.

Uniform and dense grass vegetative growth has been established on the IRM landfill cover. **Figure 3** presents a comparison of aerial photographs from 1991 (prior to construction of the IRM landfill cover) and from 2011. **Figure 3** depicts that in 1991, prior to placement of the IRM landfill cover, that the site contained areas of apparent ponding and was sparsely vegetated. The 2011 aerial photograph depicts uniform and dense vegetative growth, no ponding, and no evidence of significant erosion. This is

indicative of a landfill cover configuration that effectively promotes runoff while minimizing cover erosion.

3.2.2 Hydraulic Efficiency

Hydraulic efficiency is a parameter that is used to quantify the effectiveness of cover systems in minimizing water infiltration into the landfill waste. Reducing water infiltration through the cover system into the landfill waste provides long-term control of the quantity of leachate generated and subsequently reduces the potential for migration of leachate constituents to groundwater. The hydraulic efficiency is the percent of infiltration that is blocked by the cover; therefore, the highest possible hydraulic efficiency is 100%. The hydraulic efficiency was calculated for three landfill covers (ROD, IRM [and improved IRM], and Generic IAC § 811) using the Hydrologic Evaluation of Landfill Performance (HELP) model developed by the U.S. Army Corps of Engineers for the U.S. EPA (see **Appendix 2**).

When modeled, the new IRM landfill cover thickness measurement data indicate that the hydraulic efficiency or effectiveness of the IRM landfill cover is more than 98%. That is, the IRM landfill cover and the proposed improved IRM landfill cover is at least 98% effective in reducing infiltration into the landfill. **Table A2-2** in **Appendix 2** shows the results of the HELP model of the IRM landfill cover hydraulic efficiency. The hydraulic efficiency was modeled using the areas of the slopes with differing thicknesses (t) and a subset of the results is presented below:

- t < 2 feet has a hydraulic efficiency of 98.03%
- t = 2-3 feet has a hydraulic efficiency of 98.10%
- t = 3-5 feet has a hydraulic efficiency of 98.15%

Based on HELP model results shown above and listed in **Table A2-2**, after increasing the thickness of the IRM landfill cover on the side slopes to 3 feet as proposed in the Modified Remedy, the composite hydraulic efficiency for the side slope will remain approximately 98%.

The ROD Remedy landfill cover is estimated to have a hydraulic efficiency of 99% and the Generic IAC § 811 landfill cover is estimated to a have a hydraulic efficiency of 95%.

- ROD Remedy landfill cover
  - The ROD Remedy cover was split into one subarea for the crest and one subarea for the side slopes. This HELP model assumes a uniform cover thickness for each the crest and the side slopes. The crest and side slope hydraulic efficiencies were compiled to determine the total hydraulic efficiency of 99% using the equation below.

- IRM landfill cover (and proposed improved IRM landfill cover)
  - The IRM landfill cover was split into three subareas for the existing crest and five subareas for the existing side slopes based on the existing differential cover thickness measurements.
  - The hydraulic efficiencies of each subarea were compiled to determine the total hydraulic efficiency of 98% using the equation below.

- Generic IAC § 811 landfill soil cover (the ROD documented that IEPA and U.S. EPA consider IAC § 811 relevant and appropriate)
  - The 811 landfill cover was split into one subarea for the crest and one subarea for the side slopes. This HELP model assumes a uniform cover thickness for each the crest and the side slopes.
  - The crest and side slope hydraulic efficiencies were compiled to determine the total hydraulic efficiency of 95% using the equation below.

The total average hydraulic efficiency was calculated for each cover using the following formula:

$$\Sigma[h_i \times (sa_i / A)]$$

Where: h_i=hydraulic efficiency for Subarea i

sa_i = surface area of Subarea i
A = total surface area of the landfill

The hydraulic efficiency results are documented in **Appendix 2** and summarized below:

Cover System	Calculated Hydraulic Efficiency (percent)[1]
ROD Remedy landfill cover	99%
IRM landfill cover	98%
Proposed Improved IRM landfill cover	98%
Generic IAC § 811 landfill soil cover	95%

[1]The calculated hydraulic efficiency for the ROD Remedy landfill cover and the generic IAC § 811 landfill soil cover were documented previously to the IEPA in the *Alternative Landfill Cover System Evaluation (Revision 1)* (Geosyntec Consultants, 2007a).

These results indicate that the IRM landfill cover and the proposed improved IRM landfill cover are more effective in reducing infiltration into the landfill waste than the generic IAC § 811 soil cover and that the IRM landfill cover effectiveness is essentially equivalent to the ROD Remedy landfill cover.

3.2.3 Leachate Level Reduction

New leachate level data indicate a significant lowering of the leachate level since IRM landfill cover construction demonstrating that the IRM landfill cover has been effective in significantly reducing infiltration of precipitation into the landfill by promoting precipitation runoff and evapotranspiration and by eliminating ponding on the landfill.

Leachate level measurement data were collected from 34 gas vents and 14 dual-phase gas wells in 2008 (approximately 15 years after the IRM landfill cover installation) as documented in the *Completion Report for Remedial Construction* (Geosyntec Consultants, 2010a). These data were compared to 1995 leachate level information (surveyed ground elevation data at former seep locations and leachate well level data) as documented in the *Preliminary Remedial Design Report* (Geosyntec Consultants, 2007c). The 2008 and 1995 leachate level data used in this comparison are summarized in **Table 2**.

Figures 4 and **5** are leachate elevation contour maps that were generated using the 2008 and 1995 leachate level data in **Table 2**. Additionally, **Figure 6** depicts two cross-sections comparing the 1995 and 2008 leachate level data. The difference in volume of leachate between the **Figure 4** and **5** contour maps indicates a significant leachate level reduction over time (see calculations in **Appendix 3**). These data calculations indicate that leachate levels in the landfill have been lowered an average of approximately two (2) feet between 1995 and 2008, based on the available data.

As **Figures 4** and **5** illustrate, the 2008 data is from data points that are uniformly located across the entire landfill, whereas the 1995 data is located primarily along the edge of the landfill where leachate seeps were observed and on the top where there are 2 leachate wells. The relative increases in leachate at the side slopes from 1995 to 2008 which are illustrated in the cross-section in **Figure 6** are likely caused by the lack of data points along these areas from 1995. However, any increase or build-up of leachate at the side slopes of the landfill will be mitigated with the installation of the proposed leachate collection system. The proposed remedy includes leachate collection trenches along the side slopes which would convey leachate from these areas for treatment and/or disposal.

Further evidence of a reduction of leachate generation and leachate levels in the landfill is that the leachate surface impoundment, which receives leachate from the landfill's leachate collection system, is essentially dry. Prior to the implementation of the IRM landfill cover, several response actions were conducted to prevent leachate from overflowing the leachate surface impoundment. In 1989, approximately 80,000 gallons of leachate was removed from the leachate surface impoundment. In 1990, approximately 75,000 additional gallons of leachate was removed from the surface

impoundment and the leachate surface impoundment berms were repaired and increased in height. The leachate impoundment containing leachate is visible on the eastern margin of the site in the pre-IRM (1991) aerial photograph on **Figure 3**. The need for the 1989/1990 response actions indicated the significant level of leachate that was generated and the lack of hydraulic efficiency of the landfill's cover prior to implementation of the IRM landfill cover. Therefore, now that the surface impoundment is essentially dry it further demonstrates the effectiveness of the IRM landfill cover in reducing infiltration into the landfill and subsequent leachate generation.

3.3 Groundwater Quality Improvement

Recent groundwater sampling data indicate a significant improvement in groundwater quality since the RI. Groundwater sampling was conducted in April 2010, December 2010 and December 2011. The sampling results are documented in the following letter reports to IEPA.

- *2010 Groundwater and Leachate Sampling and Related Activities Summary* (Geosyntec Consultants, 2010b).
- *December 2010 Groundwater and Leachate Sampling Summary and Request to Discontinue Monitoring of Herbicides, Pesticides and PCBs* (Geosyntec Consultants, 2011).
- *December 2011 Groundwater Sampling Summary* (Geosyntec Consultants, 2012).

The groundwater sample analytical results are summarized in **Table 3**, which also includes previous groundwater analytical data for comparison purposes. A summary of these results are presented below for organic and inorganic site CoCs:

Organic CoCs

The site organic CoCs, as identified in the ROD, are volatile organic compounds (VOCs), including benzene, 1,1-dichloroethene (DCE), 1,2-dicholopropane (DCP), trichloroethene (TCE), tetrachloroethene (PCE), and vinyl chloride (VC).

The 2010/2011 groundwater sample laboratory analytical results indicated that benzene was the only organic CoC detected at a concentration greater than EPA Maximum Contaminant Levels (MCLs) or Illinois State Class I Groundwater Standards (ICGSs). Benzene was detected at one groundwater monitoring well location (MW06S) at a concentration that just exceeded the MCL/ICGS of 5 micrograms per liter (µg/L) during the three recent sampling events. Additionally, the benzene concentration at MW06S (7

µg/L) is significantly less than the site-specific groundwater action level of 1,370 µg/L (for the North Interface hydrostratigraphic unit) that triggers the requirement for groundwater remediation as established in the ROD. MW06S is located adjacent to the north-central portion of the landfill as depicted on **Figure 7**. No other organic CoCs were detected at concentrations greater than MCLs/ICGSs. A comparison of the recent groundwater analytical data to the RI data (from 1993, 1994 and 1995) is depicted on **Figure 7** and in concentration bar charts in **Appendix 4** and is summarized below:

- During the RI in 1995, benzene was detected at concentrations greater than the MCL/ICGS of 5 µg/L at three (3) groundwater monitoring well locations (MW06S, MW13, and MW15) at concentrations ranging between 6 µg/L and 12 µg/L. Benzene was not detected at concentrations greater than the MCL/ICGS except at one (1) groundwater monitoring location (MW06S) during the April and December 2010 and December 2011 groundwater monitoring events when benzene was detected a concentrations of 7.6, 7.7, and 7.6 µg/L, respectively.

- During the RI, DCE was detected at one (1) groundwater monitoring well location at a concentration greater than the MCL/ICGS of 7 µg/L (MW02D, 1993, 15 µg/L). DCE was not detected at any groundwater monitoring well location during the April and December 2010 and December 2011 groundwater monitoring events.

- During the RI, DCP was detected at two (2) groundwater monitoring well locations at concentrations greater than the MCL/ICGS 5 µg/L (MW14, 1995, 10 µg/L and MW16, 1995, 6 µg/L). DCP was not detected at any groundwater monitoring well location during the April and December 2010 and December 2011 groundwater monitoring events.

- During the RI, PCE was detected at two (2) groundwater monitoring well locations at concentrations greater than the MCL/ICGS of 5 µg/L (MW02S, 1993, 6 µg/L and MW14, 1995, 7 µg/L). PCE was not detected at any groundwater monitoring well location during the April and December 2010 and December 2011 groundwater monitoring events.

- During the RI, TCE was detected at two (2) groundwater monitoring well locations at concentrations greater than the MCL/ICGS of 5 µg/L (MW14, 1995, 7 and 10 µg/L and MW15, 1995, 6 µg/L). TCE was not detected at any groundwater monitoring well location during the April and December 2010 and December 2011 groundwater monitoring events.

- During the RI in 1995, VC was detected at concentrations greater than the MCL/ICGS of 2 µg/L at five (5) groundwater monitoring well locations

(MW03S, MW13, MW14, MW15, and MW16) at concentrations ranging between 3 µg/L (MW16) and 28 µg/L (MW15). Since 1995, VC has been detected at a concentration greater than the MCL/ICGS one time at one (1) groundwater monitoring well location (MW03S, 2000, 6 µg/L). VC was not detected at any groundwater monitoring well location during the April and December 2010 and December 2011 groundwater monitoring events.

The organic CoC groundwater quality improvement, documented above and illustrated on **Figure 7** and in bar charts provided in **Appendix 4**, demonstrates the IRM landfill cover's hydraulic efficiency has been effective in significantly improving groundwater quality. Based on these data, it is expected that groundwater quality will continue to improve and achieve concentrations less than MCL/ICGS for all organic CoCs.

During the 2010/2011 groundwater monitoring events, no organic CoCs were detected in the West Glacial Pathway groundwater monitoring wells at concentrations greater than MCLs/ICGSs and only one CoC (benzene) was detected in one North Interface Pathway groundwater monitoring well (MW06S) at concentrations that just exceeded the MCL/ICGS.

Inorganic CoCs

Historically, six (6) metals have been detected at groundwater monitoring well locations at concentrations greater than their respective MCLs (antimony, arsenic, chromium, lead, mercury, zinc) and 10 metals have been detected at concentrations greater than their respective ICGSs (antimony, arsenic, boron, chromium, iron, lead, mercury, magnesium, nickel, zinc).

During the April and December 2010 and December 2011 groundwater monitoring events only arsenic was detected above its MCL and only five (5) metals were detected above their respective ICGSs (arsenic, boron, iron, manganese, and nickel). Further, these metals were typically detected at concentrations just exceeding (within same order of magnitude of) their respective MCLs/ICGSs.

Based on these data, it is expected groundwater quality would continue to improve and achieve concentrations less than MCLs/ICGSs for all inorganic CoCs.

4. EVALUATION OF MODIFIED REMEDY

This section presents an evaluation to confirm that the Modified Remedy satisfies statutory requirements.

The Modified Remedy was evaluated with respect to the NCP §300.430 remedy selection requirements (nine evaluation criteria) including:

- two threshold criteria - Overall Protection of Human Health and the Environment and Compliance with Applicable or Relevant and Appropriate Requirements;
- five balancing criteria - Long-Term Effectiveness and Permanence; Reduction of Toxicity, Mobility, or Volume through Treatment; Short-Term Effectiveness; Implementability; and Cost; and
- two modifying criteria - State Acceptance and Community Acceptance.

This evaluation focuses on the landfill cover component of the remedy which is the only difference between the Modified Remedy and the ROD Remedy.

4.1 Threshold Criteria

Overall Protection of Human Health and the Environment

This criterion considers whether the Modified Remedy provides adequate protection of human health and the environment and how risks posed by applicable exposure pathways are eliminated, reduced, or controlled.

The Modified Remedy would provide adequate protection of human health and the environment by reliably preventing exposure to the landfill waste and to site contaminants over time by providing adequate storm water drainage and reducing precipitation infiltration and subsequent leachate generation and migration to groundwater. As documented in Section 3.2.2, the proposed improved IRM landfill cover (98% hydraulic efficiency) is more effective in reducing infiltration into the landfill than the generic IAC § 811 landfill soil cover (95% hydraulic efficiency) and that the landfill cover effectiveness is essentially equivalent to the ROD Remedy landfill cover (99% hydraulic efficiency).

Moreover, based on the leachate level reduction and groundwater quality improvement documented in Sections 3.2.3 and 3.3, it should be feasible to ultimately attain groundwater quality MCLs/ICGSs with the Modified Remedy landfill cover component and complimentary unchanged non-landfill cover components of the ROD Remedy.

The following table provides an evaluation of the Modified Remedy with respect to the remedial action objectives pertinent to the landfill cover component of the remedy to demonstrate how risks posed by applicable exposure pathways are eliminated, reduced, or controlled.

Pertinent Remedial Action Objective (*ROD Section VIII*)	**Analysis Summary**
"Mitigate potential human and ecological risks associated with leachate seeps, including leachate waters, sediments, and corresponding offsite precipitation."	The new and significant data indicate that the leachate level in the landfill has reduced significantly since IRM landfill cover implementation. The Modified Remedy includes placing additional compacted clay cover in limited areas on the side slopes where the IRM landfill cover is less than 3 feet thick. This landfill cover improvement and complimentary non-landfill cover components of the ROD Remedy that remain unchanged, including leachate collection and monitoring and surface water diversion systems, and a long-term operation and maintenance program, would provide long-term mitigation of these risks.
"Minimize the impacts of precipitation runoff on the surface water and sediment quality of the drainage channels and intermittent stream."	The IRM included excavation of impacted soil from the intermittent drainage channels located north of the site and backfilling of the excavated areas with clean soil and topsoil mitigating the risk associated with previously detected impacts. The Modified Remedy landfill cover component (improving IRM landfill cover) and complementary non-landfill cover components of the ROD Remedy that remain unchanged, including leachate collection and monitoring and surface water diversion systems, and a long-term operation and maintenance program, would provide long-term mitigation of this risk.
"Minimize leachate migration potential to groundwater."	The modeled hydraulic efficiency of the IRM landfill cover (98% hydraulic efficiency) is essentially equivalent to the ROD Remedy landfill cover (99% hydraulic efficiency). This efficiency has been demonstrated by a significant reduction in leachate levels and groundwater quality improvement. With an improved IRM landfill cover, the expected continued reduction in leachate generation would minimize leachate contaminant migration to groundwater to a degree essentially equivalent to the ROD Remedy.
"Return groundwater to drinking water quality through landfill containment/control measures and natural attenuation, and will comply with water quality criteria for Class I aquifers established under Illinois 35 IAC Part 620 (Groundwater	The new and significant data indicate that the leachate level in the landfill has significantly reduced and groundwater quality has significantly improved since the IRM landfill cover implementation. The Modified Remedy landfill cover component (improving the IRM landfill cover) and complimentary non-landfill

Pertinent Remedial Action Objective (*ROD Section VIII*)	**Analysis Summary**
Standards)."	cover components of the ROD Remedy that remain unchanged, including leachate collection and monitoring and surface water diversion systems, and a long-term operation and maintenance program are expected to continue to be effective in reducing the generation of leachate and groundwater contamination at the site to achieve MCLs/ICGSs.
"Address potential future impacts to surface water from migration of contaminated groundwater."	The new and significant data indicate that the leachate level in the landfill has significantly reduced and groundwater quality has significantly improved since the IRM landfill cover implementation. The Modified Remedy landfill cover component (improving the IRM landfill cover) and complimentary non-landfill cover components of the ROD Remedy that remain unchanged, including leachate collection and monitoring and surface water diversion systems, and a long-term operation and maintenance program are expected to continue to be effective in reducing the generation of leachate and groundwater contamination at the site to achieve MCLs/ICGSs and address potential future impacts to surface water (via the migration of contaminated groundwater to surface water).
"Address potential ecological risks associated with leachate seeps runoff to the intermittent stream, drainage channels to the north, and the Kishwaukee River."	The IRM included excavation of impacted soil from the intermittent drainage channels located north of the site and backfilling of the excavated areas with clean soil and topsoil mitigating the risk associated with previously detected impacts. The Modified Remedy landfill cover component (improving the IRM landfill cover) and complementary non-landfill cover components of the ROD Remedy that remain unchanged, including leachate collection and monitoring and surface water diversion systems, and a long-term operation and maintenance program would provide long-term mitigation of this risk.

Compliance with Applicable or Relevant and Appropriate Requirements

This criterion considers whether the Modified Remedy complies with applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA § 121.

ARARs can be chemical-specific, action-specific and location-specific. For the subject remedy change component, the primary ARARs are action-specific ARARs for landfill closure requirements for: (i) preventing exposure to the landfill waste and to site contaminants, (ii) providing adequate storm water drainage, and (iii) reducing precipitation infiltration and leachate generation and leachate contaminant migration to groundwater. In addition, chemical-specific ARARs for groundwater are also applicable in regards to evaluating the effectiveness of the Modified Remedy landfill cover component in reducing infiltration, leachate generation and subsequently achieving groundwater quality standards.

The site is classified as a Type I landfill, a co-disposal facility where hazardous wastes were disposed of with municipal solid wastes. In February 1969, the landfill was registered with the State of Illinois (State) and disposal operations began in a former gravel pit portion of the site. The State required the placement of a 5-foot compacted clay liner across the bottom of the former gravel pit, and vertically along the sidewalls. The landfill operated from 1969 until 1988. The landfill was permitted to receive residential, municipal, commercial and industrial wastes and the facility operated under IAC § 807. With the enactment of Resource Conservation and Recovery Act (RCRA) regulations in the early 1980s, the wastes received by the landfill were later restricted to non-hazardous. It is estimated that the landfill contains approximately 3,700,000 cubic yards of waste.

The ROD identified IAC § 807 and IAC § 811/814 as ARARs for the landfill cover component of the remedy. The ROD documented that IEPA and U.S. EPA consider that IAC § 807 is applicable and that IAC 811/814 are relevant and appropriate.

- IAC § 807 (Solid Waste) provides requirements for Municipal Solid Waste Landfills (MSWLFs) closed prior to 1990. IAC § 807 specifies that the landfill must be covered by a final cover consisting of a minimum of two (2) feet of compacted soil.

- IAC § 811 (Standards for New Solid Waste Landfills) provides requirements for new landfills after 1990. IAC § 811 specifies that the landfill must be covered by a final cover consisting of a low-permeability layer overlain by a final protective layer. The low-permeability layer must be a minimum of three (3) feet of compacted soil or a geomembrane/other low-permeability layer provided the layer is of equivalent or superior performance to the soil layer. The final protective layer must be a minimum of three (3) feet of soil.

- IAC § 814 (Standards for Existing Landfills and Units) provides requirements for MSWLFs that existed prior to 1990 and continue to operate, essentially requiring that IAC § 811 final closure provision are satisfied. IAC § 814 further

allows, as a "grandfather" provision, existing facilities to close under IAC § 807 if closure was initiated by September 18, 1992.

The new and significant data document that the average thickness of the IRM landfill cover is 5.8 feet and 57% of the cover is greater than three (3) feet thick. The Modified Remedy landfill cover component (proposed improved IRM landfill cover) would include placing additional compacted clay cover in those areas on the side slopes where the cover is less than three (3) feet thick. The improved areas would also receive a minimum of six (6) inches of topsoil to establish and maintain vegetative growth. Therefore, the Modified Remedy substantially meets the IAC § 807 final cover requirements and the IAC § 811 three (3) foot thick low permeability layer requirement. Furthermore, as documented in Section 3.2.2, the Modified Remedy landfill cover component would be more effective in reducing infiltration into the landfill than the generic IAC § 811 soil cover and that the IRM landfill cover effectiveness is essentially equivalent to the ROD Remedy landfill cover.

The ROD identified IAC § 620 and CFR § 141 as chemical-specific ARARs for evaluating groundwater quality at the site.

- IAC § 620 (Groundwater Quality) establishes groundwater classes and water quality standards (ICGSs) for the State of Illinois.

- CFR § 141 (National Primary Drinking Water Regulations) establishes primary and secondary maximum contaminant levels (MCLs), which are enforceable standards of maximum permissible levels of contaminants in drinking water.

The new and significant leachate level and groundwater quality data, documented in Sections 3.2.3 and 3.3, indicate that the Modified Remedy landfill cover component would effectively reduce the generation of leachate and groundwater contamination at the site. Groundwater quality has improved since the RI in 1994/1995 when six (6) groundwater monitoring wells had concentrations of one (1) to four (4) CoCs greater than MCLs/ICGSs compared to the most recent groundwater sampling event in 2011 when only one (1) CoC (benzene) was detected at one (1) groundwater monitoring well location (MW06S) at a concentration that exceeded MCLs/ICGSs. Based on these data, it is expected that groundwater quality would continue to improve and achieve concentrations less than groundwater quality MCLs/ICGSs for all CoCs.

This ARARs evaluation also considered 40 CFR § 300.430(f)(1)(ii)(c), which documents that an alternative that does not meet an ARAR under federal environmental or state environmental or facility siting laws may be selected under specific conditions. The following is a summary of the evaluation of these conditions applicable for the Modified Remedy:

- *Compliance with the requirement will result in greater risk to human health and the environment than other alternatives.*

  The Modified Remedy would significantly reduce the risk posed to workers, the community and the environment during construction compared to the ROD Remedy.

  The ROD remedy landfill cover would require removal of top six (6) inches of topsoil and regrading of the underlying compacted clay that would be replaced by a vegetative/protective layer over a drainage layer and GCL. It is estimated that the ROD Remedy landfill cover would require 4,000 to 6,000 additional trucks to place an additional 115,000 cubic yards of vegetative/protective layer soil above the GCL and drainage layer. This quantity of soil is not available in the west borrow area and a new south borrow area has been contemplated for the remedy. If a new borrow area cannot be developed south of the site, the cover soil would have to be imported from an offsite location. All of the above factors would increase the traffic (accident) risk along the onsite and offsite travel routes compared to the Modified Remedy.

  The Modified Remedy would reduce construction impacts to the community due to significantly less material hauling and handling activities. Construction of the ROD Remedy landfill cover would increase the potential for dust generation which could potentially affect downwind residences. This is significant considering that approximately 1,500 people live within one (1) mile of the site (U.S. EPA, 2012) and nearby residences within Wycliffe Estates are located within approximately 800 feet from the landfill.

  The Modified Remedy would significantly limit potentially substantial rainfall infiltration and subsequent leachate generation during the construction of the ROD Remedy landfill cover while a portion of the IRM cover is being removed and the new cover is being constructed.

- *The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through use of another method or approach.*

  As documented in Section 3.2.2, the proposed improved IRM landfill cover is more effective in reducing infiltration into the landfill than the generic IAC § 811 landfill soil cover (considered relevant and appropriate by IEPA and U.S. EPA) and the IRM landfill cover effectiveness is essentially equivalent to the ROD Remedy landfill cover. The new and significant leachate level and groundwater quality data, documented in Sections 3.2.3 and 3.3, indicate that the

Modified Remedy would continue to effectively reduce the generation of leachate and groundwater impacts at the site. Based on these data, it is expected that groundwater quality would continue to improve and achieve concentrations less than groundwater quality MCLs/ICGSs. The proposed Modified Remedy landfill cover improvements would add to the performance and effectiveness of the IRM landfill cover.

4.2 Balancing Criteria

Long-Term Effectiveness and Permanence

This criterion considers the expected residual risk and the ability of the Modified Remedy to maintain reliable protection of human health and the environment over time, once the remedy is implemented.

Consistent with the above evaluation of Overall Protection of Human Health and the Environment, the Modified Remedy would provide adequate long-term effectiveness and permanence by reliably preventing exposure to landfill waste and to site contaminants over time by providing adequate storm water drainage and reducing precipitation infiltration and subsequent leachate generation and migration to groundwater. With the reduction in leachate generation, it is expected that groundwater quality would continue to improve and achieve concentrations less than groundwater quality MCLs/ICGSs.

The Modified Remedy would adequately address long-term cover durability issues considering the substantial thickness and character of the IRM landfill cover and the proposed landfill cover improvements. In addition, the Modified Remedy cover and the planned landfill gas management component of the ROD Remedy that remains unchanged would provide for adequate long-term landfill gas control.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion considers the anticipated performance of treatment technologies in reducing the toxicity, mobility, or volume of contaminants at the site.

For the Modified Remedy, groundwater quality is improved by reducing precipitation infiltration and the subsequent continued reduction in leachate generation and leachate migration to groundwater. As documented in Section 3.2.2, the proposed improved IRM landfill cover (98% hydraulic efficiency) is more effective in reducing infiltration into the landfill than the generic IAC § 811 soil cover (95% hydraulic efficiency) and the IRM landfill cover effectiveness is essentially equivalent to the ROD Remedy landfill cover (99% hydraulic efficiency). Further, based on the leachate level reduction and groundwater quality improvement documented in Sections 3.2.3 and 3.3, it is

expected that groundwater quality would continue to improve and achieve concentrations less than groundwater quality MCLs/ICGSs.

Short-Term Effectiveness

This criterion considers the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy.

The Modified Remedy consists of improving the IRM landfill cover, as opposed to removing a portion of the IRM cover and constructing the ROD proposed new cover. The Modified Remedy would have greater short-term effectiveness than the ROD Remedy because the Modified Remedy would:

- Significantly reduce the period needed to implement the remedy. It is estimated that the Modified Remedy would be implemented approximately one year faster than the ROD remedy.

- Significantly reduce the risk posed to workers, the community and the environment during construction compared to the ROD Remedy. The ROD Remedy landfill cover would require removal of six (6) inches of topsoil and regrading of the underlying compacted clay that would be replaced by a vegetative/protective layer over a drainage layer and GCL. It is estimated that the ROD Remedy landfill cover would require 4,000 to 6,000 additional trucks to place an additional 115,000 cubic yards of vegetative/protective layer soil above the drainage layer and GCL. Further, if a new borrow area cannot be developed south of the site, the cover soil would have to be imported from an offsite location. All of the above factors would increase the traffic (accident) risk along the onsite and offsite travel routes compared to the Modified Remedy. In addition, construction of the ROD Remedy landfill cover would increase the potential for dust generation which could potentially affect downwind residences. This is significant considering that approximately 1,500 people live within one (1) mile of the site (U.S. EPA, 2012) and nearby residences within Wycliffe Estates are located within approximately 800 feet from the landfill.

- Limit potentially substantial rainfall infiltration and subsequent leachate generation during the construction of the ROD proposed landfill cover while a portion of the IRM landfill cover is being removed and replaced.

As documented in Section 5, the Modified Remedy would have a significantly smaller environmental footprint compared to the ROD Remedy during remedy implementation.

Implementability

This criterion considers the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

The Modified Remedy landfill cover component is readily implemented with commonly used construction materials and techniques. It is more easily implemented than the ROD Remedy landfill cover. It is estimated that the Modified Remedy would be implemented approximately one year faster than the ROD remedy.

Cost

This criterion considers the cost of the Modified Remedy. The cost of the Modified Remedy is expected to be approximately 30 percent less than the ROD remedy.

Pursuant to NCP §300.430(f)(1)(ii)(D), a remedy is considered cost-effective if its costs are proportional to its overall effectiveness. The analysis herein demonstrates that the Modified Remedy satisfies the threshold criteria (protective of human health and the environment and ARAR-compliant) and the other balancing criteria (long-term effectiveness and permanence, short-term effectiveness and implementability). Therefore, the relationship of the overall effectiveness of the Modified Remedy is considered to be proportional to its costs and hence the Modified Remedy is considered cost-effective. Moreover, considering the proposed improved IRM landfill cover effectiveness is essentially equivalent to the ROD Remedy landfill cover, the Modified Remedy is significantly more cost effective than the ROD Remedy because the Modified Remedy has the same effectiveness and is approximately 30 percent less costly.

4.3 Modifying Criteria

State Acceptance

It is anticipated that the Modified Remedy would require administrative approval from U.S. EPA and IEPA through an Explanation of Significant Differences (ESD) or a ROD Amendment. In the interim, BFINA will continue to seek active agency participation related to the Modified Remedy to ensure timely resolution of agency concerns. As indicated in Section 1, submittal of this Technical Memorandum follows a 28 February 2012 meeting with IEPA in which BFINA and Geosyntec presented a summary of the rationale for the Modified Remedy documented herein. The presentation handouts are included in **Appendix 1**.

Community Acceptance

Community acceptance of the Modified Remedy would be assessed through public comments received as part of the ESD or ROD Amendment process.

4.4 Evaluation Summary

A summary of the above NCP criteria evaluation, confirming that the Modified Remedy satisfies statutory requirements, is presented below. This summary focuses on the landfill cover component of the remedy which is the only difference between the Modified Remedy and the ROD Remedy.

NCP Criteria	Satisfied by Modified Remedy?
Overall Protectiveness of Human Health and the Environment	***YES*** - The Modified Remedy would provide adequate protection of human health and the environment by reliably preventing exposure to the landfill waste and to site contaminants over time by providing adequate storm water drainage and reducing precipitation infiltration and subsequent leachate generation and migration to groundwater. The evaluation of the Modified Remedy with respect to the remedial action objectives pertinent to the landfill cover component of the remedy demonstrated that the Modified Remedy substantially eliminates, reduces or controls applicable site exposure pathways.
Compliance with ARARs	***YES*** - Action-Specific ARARs: The Modified Remedy landfill cover component meets the IAC § 807 final cover requirements (considered applicable by IEPA and U.S. EPA), is more effective in reducing infiltration into the landfill than the generic IAC § 811 landfill soil cover (considered relevant and appropriate by IEPA and U.S. EPA), and has essentially an equivalent effectiveness in reducing infiltration into the landfill as the ROD Remedy landfill cover. Chemical-Specific ARARs: Based on new groundwater quality (improvement) data, it is expected that groundwater quality would continue to improve and achieve concentrations less than groundwater quality MCLs/ICGSs for all CoCs.
Long-Term Effectiveness and Permanence	***YES*** - The Modified Remedy provides long-term effectiveness and permanence by preventing exposure to landfill waste and to site contaminants over time by providing adequate storm water drainage and reducing precipitation infiltration and subsequent leachate generation and migration to groundwater in a manner that is essentially equivalent to the ROD Remedy. The Modified Remedy would adequately address long-term cover durability issues considering the substantial thickness and character of the IRM landfill cover and the proposed landfill cover

NCP Criteria	Satisfied by Modified Remedy?
	improvements. In addition, the Modified Remedy cover and the planned landfill gas management component of the ROD Remedy that remains unchanged would provide for adequate long-term landfill gas control.
Reduction of Toxicity, Mobility, or Volume through Treatment	***YES*** - Based on the new and significant leachate level reduction and groundwater quality improvement data, it is expected that groundwater quality will continue to improve and achieve concentrations less than groundwater quality MCLs/ICGSs.
Short-Term Effectiveness	***YES*** - The Modified Remedy provides a higher degree of short-term effectiveness than the ROD Remedy. The Modified Remedy would significantly reduce the period needed to implement the remedy; significantly reduce the risk posed to workers, the community and the environment during construction; and significantly limit potentially substantial rainfall infiltration and subsequent leachate generation during the construction of the ROD Remedy landfill cover while a portion of the IRM landfill cover is being removed and the new cover is being constructed. As documented in Section 5, the Modified Remedy would have a significantly smaller environmental footprint compared to the ROD Remedy during remedy implementation.
Implementability	***YES*** - The Modified Remedy is more easily implemented than the ROD Remedy; estimated to be implemented approximately one year faster than ROD Remedy.
Cost	***YES*** - The Modified Remedy is more cost effective than the ROD Remedy. The Modified Remedy is expected to have a cost approximately 30 percent less than the ROD remedy with essentially an equivalent effectiveness.
State Acceptance	Contingent upon approval from U.S. EPA and IEPA through an ESD or ROD Amendment.
Community Acceptance	Public comments would be solicited through an ESD or ROD Amendment.

5. MODIFIED REMEDY ENVIRONMENTAL FOOTPRINT

In *Superfund Green Remediation Strategy* (U.S. EPA, 2010), "*EPA defines green remediation as the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions.*" This U.S. EPA strategy document further states that "*Environmental and community effects from cleanup activities, including fossil fuel consumption, emission of GHG and air pollutants, disruption to water cycle balances, and soil erosion, need to be considered.*"

The Modified Remedy would have a significantly smaller environmental footprint than the ROD Remedy during remedy implementation based on reduced fossil fuel consumption and emissions and reduced potential for soil erosion and fugitive dust emissions as described below.

- ***Reduced Fossil Fuel Consumption and Emissions.*** The Modified Remedy would reduce the consumption of fossil fuels and associated emissions of GHG and air pollutant emissions compared to the ROD Remedy.

  It is estimated that the Modified Remedy would be implemented approximately one year faster than the ROD Remedy, significantly reducing the use of heavy construction equipment onsite and the consumption of fossil fuels and associated emissions.

  It is estimated that the ROD Remedy would require an estimated 4,000 to 6,000 additional truck loads to haul an additional 115,000 cubic yards of landfill cover materials. Further, if a new borrow area cannot be developed south of the site, this cover soil would need to be imported from an offsite location further increasing the consumption of fossil fuels and associated emissions.

  The Modified Remedy significantly limits potentially substantial rainfall infiltration and subsequent leachate generation during the construction compared to the ROD Remedy (while a portion of the vegetation and topsoil of the IRM landfill cover is removed and the new cover is constructed). This reduces the quantity of leachate that would be collected by the leachate collection system and potentially require off-site hauling (and further consumption of fossil fuels and associated emissions).

- ***Reduced Potential for Soil Erosion and Fugitive Dust Emissions.*** The Modified Remedy would significantly reduce the potential for soil erosion and fugitive dust emissions during remedy implementation. Significantly less land area would be disturbed and the land disturbance would be over a significantly

less period of time for the Modified Remedy compared to the ROD Remedy. **Figure 8** shows the approximate area (4.1 acres) that would need to be disturbed to bring the clay cover thickness to 2 feet or greater over the entire landfill (47 acres). **Figure 9** shows the approximate area (19.3 acres) that would need to be disturbed to bring the clay cover thickness to 3 feet or greater over the entire landfill (47 acres). **Table A2-2** in **Appendix 2** shows the results of the HELP model of the IRM landfill cover hydraulic efficiency. The hydraulic efficiency was modeled using the areas of the slopes with differing thicknesses (t) and a subset of the results is presented below:

- t < 2 feet has a hydraulic efficiency of 98.03%
- t = 2-3 feet has a hydraulic efficiency of 98.10%
- t = 3-5 feet has a hydraulic efficiency of 98.15%

Based on HELP model results shown above and listed in **Table A2-2**, after increasing the thickness of the IRM landfill cover on the side slopes to 3 feet as proposed in the Modified Remedy, the composite hydraulic efficiency for the side slope will remain approximately 98%.

Consistent with providing a higher degree of Short-Term Effectiveness, reducing the environmental footprint for the Modified Remedy also serves to reduce the risk of adverse impacts to site workers and local community residents during remediation implementation. This is significant considering that approximately 1,500 people live within one (1) mile of the site (U.S. EPA, 2012) and nearby residences within Wycliffe Estates are located within approximately 800 feet from the landfill.

6. SUMMARY AND CONCLUSIONS

A Modified Remedy is proposed for the MIG/DeWane Landfill Superfund Site based on new and significant information collected since the ROD was issued.

The Modified Remedy includes modifying the landfill cover component of the ROD Remedy. No other changes to the ROD Remedy are proposed. The Modified Remedy would include making improvements to the substantial IRM landfill cover instead of constructing the new landfill cover system component of the ROD Remedy. The proposed improvements would include placing additional compacted clay cover in areas on the side slopes where the cover is less than three (3) feet thick and grading of the IRM landfill crest to establish a minimum slope of three (3) percent, consistent with the ROD Remedy. The improved areas would receive a minimum of six (6) inches of topsoil and seeded to establish and sustain vegetative growth.

The Modified Remedy is based on new and significant information collected since the ROD was issued. This new information, which is not included elsewhere in the Administrative Record file for the site, includes significant additional IRM landfill cover system thickness measurement data, leachate level measurement data, and groundwater quality data.

These data document: (i) a substantial IRM landfill cover thickness consisting of an average of 11.5 feet of compacted clay and topsoil on the landfill crest and an average of 3.8 feet of compacted clay and topsoil on the landfill side slopes; (ii) a modeled hydraulic efficiency (98%), which is essentially equivalent to the ROD Remedy landfill cover, and which has been empirically demonstrated by a significant lowering of leachate levels (an average 2-foot reduction in leachate levels between 1995 and 2008); and (iii) significant groundwater quality improvement since the RI.

The evaluation of the Modified Remedy with respect to the NCP criteria demonstrated that the Modified Remedy satisfies the statutory requirements.

The Modified Remedy is protective of human health and the environment; compliant with Federal and State requirements that are applicable or relevant and appropriate, and/or compliant with NCP § 300.430(f)(1)(ii)(c), which documents that a remedy may be selected (under specific conditions) that does not meet all potentially applicable or relevant and appropriate requirements; and provides long-term effectiveness and permanence in a manner that is essentially equivalent to the ROD Remedy.

The Modified Remedy provides a higher degree of short-term effectiveness and implementability than the ROD Remedy. The Modified Remedy would: (i) significantly reduce the period needed to implement the remedy; (ii) significantly reduce the risk posed to workers, the community and the environment during

construction; and (iii) significantly limit potentially substantial rainfall infiltration and subsequent leachate generation during the construction of the ROD proposed landfill cover while a portion of the IRM landfill cover is being removed and replaced.

The Modified Remedy is expected to have a cost approximately 30 percent less than the ROD remedy with essentially an equivalent effectiveness.

The Modified Remedy was also evaluated with respect to the *Superfund Green Remediation Strategy* (U.S. EPA, 2010). This evaluation demonstrated that the Modified Remedy would have a significantly smaller environmental footprint than the ROD Remedy during remedy implementation.

Consistent with providing a higher degree of Short-Term Effectiveness, reducing the environmental footprint for the Modified Remedy also serves to reduce the risk of adverse impacts to site workers and local community residents during remediation implementation. This is significant considering that approximately 1,500 people live within one (1) mile of the site (U.S. EPA, 2012) and nearby residences within Wycliffe Estates are located within approximately 800 feet from the landfill.

It is concluded that the proposed Modified Remedy represents an appropriate remedy change for the MIG/DeWane Landfill Superfund Site. The Modified Remedy meets the statutory requirements, has an essentially equivalent effectiveness as the ROD Remedy, is significantly more cost-effective than the ROD Remedy, and would be more protective of human health and the environment and have a smaller environmental footprint than the ROD Remedy during implementation.

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